



EMI REGISTRY MANUAL

EMIR Product Team

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| Document Version: | 1.2.0 |
| Component Version: | 1.2.0 |
| Date: | 09 07 2012 |

This work is co-funded by the EC EMI project under the FP7 Collaborative Projects Grant Agreement Nr. INFSO-RI-261611.

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1 Overview

EMI Service Registry is a Service Endpoint Registry conceived during the EMI project. Its main goal is to discover all the Service Endpoints that exist. It consists of a collection of services that enables storing service records in a federated manner. Each of the record is a Service Endpoint Record (SER) complying with the OGF's GLUE 2.0 standard. The deployment of EMIR (which implies building an EMIR network over WAN) is bipartite: 1) Building a rooted hierarchy with a single EMIR server aggregating all the information within a federation 2) Sharing the information at the root level among peered EMIR servers (using P2P), thus enabling intra-federation discovery.

2 Features

The EMIR provides following features:

- the service endpoint record registration includes the management of the services' endpoint information.
- Powerful data back-end based on MongoDB
- Schema-free information model based on JSON (using GLUE2 entity names for specific attributes)
- REST-ful API to browse the service registrations
- Security
 - PKI governed authentication
 - Policy based authorisation

For more information about EMIR, visit EMI's TWiki[<https://twiki.cern.ch/twiki/bin/view/-EMI/EMIRRegistry>].

3 Installation

In order to install EMIR, it is required to install the SUN or OpenJDK Java 6 (JRE or SDK). If not installed on the target system, it can be downloaded from <http://java.oracle.com>

- Linux based operating system
- [MongoDB](#)

EMIR is distributed in the following formats:

- Platform independent format, provided in "tar.gz" format
- RPM package, suitable SL5/SL6 and other Fedora based Linux derivatives (RedHat, CentOS etc...)
- Debian package

IMPORTANT NOTE ON PATHS

The location of the installation and configuration files differ depending on the type of bundle (see the above section).

If RPM bundle is being installed, the following paths will be used:

```
CONF=/etc/emi/emir
BIN=/usr/sbin
LOG=/var/log/emi/emir
```

The platform independent binary places all the files under single directory. The contents will be:

```
CONF=INST/conf/
BIN=INST/bin/
LOG=INST/logs/
```

The above variables (CONF, BIN and LOG) will be used throughout the rest of this manual.

3.1 Installation using the RPM bundle (RedHat Distributions)

Download EMIR Server's RPM distribution from the EMI's [emisoft](#) and install it using the rpm or yum command.

Example

```
yum install -y emi-emir
```

3.2 Installation using the Debian bundle (Centos/Debian Distributions)

Download EMIR DEB distribution from the EMI's [emisoft](#) and install it using the apt-get command.

3.3 Database Installation

EMIR server uses MongoDB database as a backbone to store and index SER collections. The database dependency will automatically be fetched from the **emisoft** repository, while installing

the EMIR Server. Otherwise it should be installed and configured before installing the EMIR. The installation and configuration instructions to setup the MongoDB database can be found on MongoDB's [Web site](#).

3.4 Installation from the self-contained archive (tar.gz)

In order to generate, build and install the self contained binary it is required to follow the steps written below:

CREATING THE BUNDLE

1. check out the source code from [git://github.com/eu-emi/emiregistry.git](https://github.com/eu-emi/emiregistry.git)
2. go to **SOURCE_ROOT/emir-dist** directory
3. run **mvn assembly:assembly -DskipTests**

The archive can be found inside the **SOURCE_ROOT/target/emir-distribution-x.y.z-a-all.(tar.gz/zip)**, that contains all the necessary files for installation thus no special actions will be required except extraction to the target folder.

4 Configuration

The EMIR server comes with a well documented configuration file (CONF/emir.config), containing a number of options to setup registry hierarchy, p2p, security, http server, and database. The settings in the configuration file are pre-defined to start-up the server in a non-production environment, however the administrator needs to review before deploying on the production Grid environments.

4.1 General Configuration

The server configuration options in the CONF/emir.config are:

- Server address (plain or SSL)
- Settings of the type of the registry node, i.e. whether the current EMIR server instance is a child of some other (a parent) EMIR server node or a top/global registry in a hierarchy.

| Property name | Type | Default value | Description |
|--------------------------------|------|---------------|-------------|
| <i>Server general settings</i> | | | |

| Property name | Type | Default value | Description |
|---------------------------------|------------------|------------------------------------|---|
| <code>emir.address</code> | string | <code>http://localhost:8080</code> | The address/URL of the EMIR server on which it receives registration and query requests. It should either start with <code>http</code> or <code>https</code> (SSL/TLS) mode, if "https" mode is selected the Authentication and Authorisation properties must be properly configured |
| <code>emir.anonymousPort</code> | Unsigned Integer | 9127 | The anonymous http port number. Setting the property will start an additional <i>http</i> server (without SSL/TLS) only if the above server address is <i>https</i> (with SSL/TLS). It will provide <i>anonymous</i> access to the query interface (i.e. /services REST Web Service). |

4.2 PKI Trust Settings Configuration

EMIR endorses Public Key Infrastructure (PKI) trust settings to validate certificates using EMI's CaNL (JAVA version). The validation is performed when a connection with a remote peer is initiated over the network, using the SSL (or TLS) protocol, i.e. `emir.address` value has *https* scheme.

Certificates validation is primarily configured using a set of initially trusted certificates of so called Certificate Authorities (CAs). Those trusted certificates are also known as *trust anchors* and their collection is called as a *trust store*.

The validation mechanism except the *trust anchors* can use additional input for checking if a certificate being checked was not revoked and if its subject is in a permitted namespace.

EMIR allows for different types of trust stores. All of them are configured using a set of properties.

| Property name | Type | Default value / mandatory | Description |
|--|---|---------------------------|--|
| emir.security.trust[ALLOW,allow,ALLOW] | [ALLOW,allow,ALLOW] | ALLOW | controls whether proxy certificates are supported |
| emir.security.trust[keystore,type,openssl,directory] | [keystore,type,openssl,directory] | mandatory to be set | The truststore type. |
| emir.security.trust[integer number,600] | integer number | 600 | how often the truststore should be reloaded, in seconds. |
| --- Directory --- | | | |
| emir.security.trust[integer number,15] | integer number | 15 | Connection timeout for fetching the remote CA certificates in seconds. |
| emir.security.trust[file system path,directory] | file system path | directory | Directory where CA certificates should be cached, after downloading them from a remote source. Can be left undefined if no disk cache should be used. Note that directory should be secured, i.e. normal users should not be allowed to write to it. |
| emir.security.trust[PEM,DER] | [PEM,DER] | PEM | For directory truststore controls whether certificates are encoded in PEM or DER. |
| emir.security.trust[list of properties with a common prefix,directoryLocation] | list of properties with a common prefix | directoryLocation | List of CA certificates locations. Can contain URLs, local files and wildcard expressions. |
| --- Keystore --- | | | |
| emir.security.trust[string,keystoreFormat] | string | keystoreFormat | The keystore type (jks, pkcs12) in case of truststore of keystore type. |
| emir.security.trust[string,keystorePassword] | string | keystorePassword | The password of the keystore type truststore. |
| emir.security.trust[string,keystorePath] | string | keystorePath | The keystore path in case of truststore of keystore type. |
| --- Openssl --- | | | |

| Property name | Type | Default value / mandatory | Description |
|---|---|---------------------------|---|
| emir.security.truststore.openssl.pathgrid | [GLOBUS_EUGRIDPMA_REQUIRE, EU-GRIDPMA_GLOBUS, GLOBUS, EUGRIDPMA, GLOBUS_EUGRIDPMA_REQUIRE, EU-GRIDPMA_GLOBUS_REQUIRE, GLOBUS_REQUIRE, EU-GRIDPMA_REQUIRE, EU-GRIDPMA_AND_GLOBUS, EU-GRIDPMA_AND_GLOBUS_REQUIRE, IGNORE] | | in case of openssl truststore, controls which (and in which order) namespace checking rules should be applied |
| emir.security.truststore.openssl.pathgrid | filesystem path | PathGrid | directory to be used for openssl truststore |
| --- Revocation --- | | | |
| emir.security.truststore.connection.timeout | integer number | ConnectionTimeOut | Connection timeout for fetching the remote CRLs in seconds (not used for Openssl truststores). |
| emir.security.truststore.diskCachePath | filesystem path | DiskCachePath | Directory where CRLs should be cached, after downloading them from remote source. Can be left undefined if no disk cache should be used. Note that directory should be secured, i.e. normal users should not be allowed to write to it. Not used for Openssl truststores. |
| emir.security.truststore.crlLocations.* | list of properties with a common prefix | | List of CRLs locations. Can contain URLs, local files and wildcard expressions. Not used for Openssl truststores. |

| Property name | Type | Default value / mandatory | Description |
|---|---|---------------------------|--|
| emir.security.truststore.crlMode | [REQUIRE, IF_VALID, IGNORE] | IF_VALID | General CRL handling mode. The IF_VALID setting turns on CRL checking only in case the CRL is present. |
| emir.security.truststore.crlUpdateInterval | integer number | 600 | How often CRLs should be updated, in seconds. |
| emir.security.truststore.ocspCacheTtl | integer number | 3600 | For how long the OCSP responses should be locally cached in seconds (this is a maximum value, responses won't be cached after expiration) |
| emir.security.truststore.ocspCachePath | filesystem path | DiskCache | If this property is defined then OCSP responses will be cached on disk in the defined folder. |
| emir.security.truststore.ocspLocalResponderPrefix | list of properties with a common prefix | LocalResponder | Optional list of local OCSP responders |
| emir.security.truststore.ocspMode | [REQUIRE, IF_AVAILABLE, IGNORE] | IF_AVAILABLE | General OCSP checking mode. REQUIRE should not be used unless it is guaranteed that for all certificates an OCSP responder is defined. |
| emir.security.truststore.ocspTimeout | integer number | 1000 | Timeout for OCSP connections in milliseconds. |
| emir.security.truststore.ocspRevocationOrder | [CRL, OCSP, OCSP_CRL] | OCSP, CRL | Controls overall revocation sources order |
| emir.security.truststore.ocspRevocationUseAll | [true, false] | false | Controls whether all defined revocation sources should be always checked, even if one the first one already confirmed that a checked certificate is not revoked. |

4.2.1 Examples

Directory truststore, with complete set of options:

```

emir.security.truststore.type=directory
emir.security.truststore.allowProxy=DENY
emir.security.truststore.updateInterval=1234
emir.security.truststore.directoryLocations=/trust/dir/*.pem http://caserver/ca.pem
emir.security.truststore.directoryEncoding=PEM
emir.security.truststore.directoryConnectionTimeout=100
emir.security.truststore.directoryDiskCachePath=/tmp
emir.security.truststore.crlLocations=/trust/dir/*.crl http://caserver/crl.pem
emir.security.truststore.crlUpdateInterval=400
emir.security.truststore.crlMode=REQUIRE
emir.security.truststore.crlConnectionTimeout=200
emir.security.truststore.crlDiskCachePath=/tmp

```

Openssl truststore:

```

emir.security.truststore.type=openssl
emir.security.truststore.opensslPath=path/to/truststores/openssl
emir.security.truststore.opensslNsMode=EUGRIDPMA_GLOBUS_REQUIRE
emir.security.truststore.allowProxy=ALLOW
emir.security.truststore.updateInterval=1234
emir.security.truststore.crlMode=IF_VALID

```

Java keystore used as a trust store:

```

emir.security.truststore.type=keystore
emir.security.truststore.keystorePath=path/to/truststores/emir-truststore.jks
emir.security.truststore.keystoreFormat=JKS
emir.security.truststore.keystorePassword=xxxxxxx

```

4.3 Configuring the Credentials

EMIR uses private key and a corresponding certificate (called together as a *credential*) to identify clients and servers. The credentials can be provided in several formats. The following table list all possible variants and corresponding parameters.

| Property name | Type | Default value / mandatory | Description |
|--------------------------------|-------------------------|---------------------------|---|
| emir.security.credentialFormat | [jks, pkcs12, der, pem] | | format of the credential |
| emir.security.credentialAlias | string | | keystore alias of the key entry to be used (can be ignored if the keystore contains only one key entry) |

| Property name | Type | Default value / mandatory | Description |
|--------------------------------------|------------------|---------------------------|---|
| emir.security.credential.keyPassword | string | | private key password in keystore (if different from the main credential password) |
| emir.security.credential.keyPath | string | | location of the private key if stored separately from the main credential |
| emir.security.credential.password | string | | password required to load the credential |
| emir.security.credential.filePath | file system path | mandatory to be set | credential location |

4.3.1 Examples

Credential as a pair of DER files:

```
credential.format=der
credential.password=emi
credential.path=path/to/credentials/cert-1.der
credential.keyPath=path/to/credentials/pk-1.der
```

Credential as a JKS file (type can be autodetected in almost every case):

```
credential.path=path/to/credentials/server1.jks
credential.password=xxxxxxx
```

4.4 Authorization

The EMIR offers two alternative options to authorise its' clients.

- Using Access Control List (ACL)
- XACML Policy based authorization

4.4.1 ACL Based Authorization

This is the default mechanism to access control the *Create*, *Update*, and *Delete* operations on EMIR's SER database. The client SERP or child DSR registering SERPs with a parent DSR/GSR get authorised while matching it's distinguished name (DN) against the pre-defined ACL file (CONF/emir.acl). Whereas the file contains a list of DN and role pairs, separated by :: symbol, see the example below:

the property in the CONF/emir.config file

| Property name | Type | Default value | Description |
|-----------------------------|-----------------|---------------|------------------------------|
| emir.security.accesscontrol | filesystem path | CONF/emir.acl | The location of the ACL file |

ACL file contents

```
emailAddress=emiregistry@user.eu,CN=EMIRRegistry-Demo-User,OU=JSC,O= ↵  
Forschungszentrum Juelich GmbH,L=Juelich,C=DE :: serviceowner  
emailAddress=emiregistry@user.eu-admin,CN=EMIRRegistry-Demo-User- ↵  
Admin,OU=JSC,O=Forschungszentrum Juelich GmbH,L=Juelich,C=DE :: ↵  
admin
```

The public key certificate or DN should be sent to the DSR administrator for successful SER registrations.

Roles: There are only two pre-defined roles within the scope of ACL file:

- the `admin` is a super user who can change any registration, owned by anyone, and
- the `serviceowner` is only allowed to create new or modify his created SERPs.



Important

The ACL based authorisation is only activated when the DSR/GSR is running on SSL/TLS mode

4.5 Policy Based Authorization with XACML

Using XACML 2.0 is an alternative way to authorize clients (User, EMIR-SERP, DSR, or GSR) in a fine grained manner. The administrator should review the policies defined in the `CONF/xacml2Policies/` folder and change them according to her infrastructure needs. However the already defined policies provides a good starting point to the administrators to define/modify the policies.



Important

the XACML policy based authorization will be ignored, if the ACL based authorisation is activated

In order to enable the XACML based authorization: attribute sources and policies must be configured.

4.5.1 Setting Attribute Sources

EMIR only supports file based attribute sources; the client DNs can be included in the attributes file.

Table 1: File Attribute Source Settings

| Property name | Type | Default value | Description |
|---|------------------|-----------------------|--|
| emir.security.attributes.order | string | FILE | This property is a space separated list of attribute source names, which are then configured in detail below. The named attribute sources are queried in the given order. |
| emir.security.attributes.FILE.eclass.emir.attributeSource | string | | configuration of the <i>FILE</i> attribute source |
| emir.security.attributes.FILE-matching | [strict, regexp] | | Specifies the matching or client DNs |
| emir.security.attributes.FILE.CONF/users/test | filesystem path | or CONF/users/test | The path to the file containing subjects' DNs. The file suffixed with strict use strict checking of DNs, whereas the file suffixed with regexp contain entries using regular expressions |

4.5.2 Setting XACML Policies

Table 2: Policy settings

| Property name | Type | Default value | Description |
|---|-----------------|------------------|--|
| emir.security.accessControlPolicy.xacml2.conf | filesystem path | CONF/xacml2.conf | The path to the XACML2 configuration, containing the rules of executing the policies |

Table 2: (continued)

| Property name | Type | Default value | Description |
|--|--------|-------------------------|---|
| emir.security.accesscontrol.policy.unicore.uas | string | emir.policy.unicore.uas | The name of the pdp class to endorse, for the xacml2 policies execution |

The `CONF/xacml2.config` file contains raw xacml polices, enable EMIR (DSR or GSR) administrators to write their own rules.

4.6 MongoDB Database Configuration

The EMIR uses MongoDB to store and index the SER collections. It must be configured and running before deploying any EMIR (DSR or GSR) server.

| Property name | Type | Default value | Description |
|----------------------------|---------|---------------|--|
| <i>Connection Settings</i> | | | |
| mongodb.hostName | string | localhost | Fully qualified host name of the machine on which MongoDB is setup |
| mongodb.port | Integer | 27017 | The port number |
| <i>Database Settings</i> | | | |
| mongodb.dbName | string | emiregistry | The name of the database to store the SERP records |
| mongodb.colName | string | services | The name of the collection (of the database) in which the records will be stored |
| <i>Login Settings</i> | | | |
| mongodb.userName | string | – | The username to access the MongoDB database |
| mongodb.password | string | – | The password to access the MongoDB database |

For high loads, especially at the GSR level, it is recommended to setup MongoDB [replication](#) for enhanced scalability and performance.

4.7 Building EMIR Network

EMIR allows building a network of registries participating in a Grid infrastructure or federation. The network can be of type hierarchical or Peer-to-Peer (P2P). In an hierarchical network, the SER collections are propagated from leaf DSR node to the top level root node, called GSR. Each DSR has only one parent, either DSR or GSR to which it pushes its SER collections. At the root level the P2P network of GSR is formed to replicate the SER collections among multiple GSRs by referring a pre-configured `Global list`. The global list contains a listing of URLs of all the GSRs, each of which should be able to access the URLs.

4.7.1 How to Setup DSR?

In order to build hierarchy of DSRs must be able to propagate the SER collections to any **single** parent DSR or a GSR.

Table 3: Parent DSR Settings

| Property name | Type | Default value | Description |
|---------------------------------|--------|-------------------------------|--|
| <i>EMIR's DSR settings</i> | | | |
| <code>emir.parentAddress</code> | string | <code>http://localhost</code> | The address/URL (http or https) of the EMIR DSR server to which it propagates its SER collection |



Important

Add DN of child DSR into the parent DSRs `CONF/emir.acl` or `CONF/users/testUserDn.xml` (strict | regexp.xml)

4.7.2 How to Setup GSR?

The root level GSR has two primary functions:

- aggregation of children DSR SER collections
- replicating the SER collections among other GSRs (visible of *Global List*)

Table 4: GSR Settings

| Property name | Type | Default value | Description |
|---|------------------|---|--|
| <i>EMIR's DSR settings</i> | | | |
| <code>emir.parentAddress</code> | string | http://localhost:4444 | The address/URL (http or https) of the EMIR server to which it propagates its information |
| <i>General GSR Settings</i> | | | |
| <code>emir.global.enable</code> | boolean | false | If set to true, indicating the registry node is global. It will then replicate the state among peer global registries (GSRs), the <i>emir.parentAddress</i> property will be ignored (if enabled), as the root registry should not contain any parent. |
| <code>emir.global.sparsity</code> | Unsigned Integer | 2 | It determines the number of neighbors as a function of the actual number of member nodes of the network. |
| <code>emir.global.retry</code> | Unsigned Integer | 5 | It specifies a number of attempts if communication to another GSR is failed. |
| <code>emir.global.etValid</code> | Unsigned Integer | 12 | Specifies period in hours for checking the entries in the soft state database and strip the expired entries (but still keeps them). |
| <code>emir.global.softStateDelay</code> | Integer | 2 | Extend the expiration time with this time delay in hours. |
| <code>emir.global.etRemove</code> | Integer | 24 | Specifies period in hours for checking the entries in the soft state database and remove the expired entries. |
| <i>Global List Settings</i> | | | |

Table 4: (continued)

| Property name | Type | Default value | Description |
|--------------------------------------|------------------------|---------------|--|
| <code>emir.global.providerURL</code> | URL or filesystem path | – | Link to the document listing GSR URLs. The URL(s) is/are important for building the GSR's P2P network at the global level. |

**Important**

Add DN of child DSR into the GSRs `CONF/emir.acl` or `CONF/users/testUd-(strict | regsexp).xml`

4.8 Service Endpoint Record (SER) Management

4.8.1 Setting Service Endpoint Records (SER) Lifetime

In EMIR, every SER has associated lifetime or (Time-To-Live) TTL. The settings can be defined in DSR or GSR to restrict the maximum assignable lifetime and assign default lifetime if missing from the registration.

Table 5: SER TTL Settings

| Property name | Type | Default value | Description |
|------------------------------------|----------------------------|---------------|---|
| <code>emir.record.expiryMax</code> | Unsigned Integer (in days) | – | Maximum assignable lifetime for the SERs containing the <code>Service_ExpireOn</code> property, defined in days, minimum value: 1. |
| <code>emir.record.expiryDef</code> | Unsigned Integer | – | The default lifetime will be set from the given property if the incoming registration is without the <code>Service_ExpireOn</code> attribute. |

4.8.2 Filtering Service Endpoint Records (SER)

EMIR offers a way to block

- SERs from being registered via DSR or EMIR-SERP
- SERs from being propagated to it's parent DSR or GSR

Table 6: SER Filter Settings

| Property name | Type | Default value | Description |
|------------------------------------|-----------------|--------------------------------|--|
| <code>emir.record.blockList</code> | filesystem path | <code>CONF/inputfilter</code> | The file containing list of SER IDs, matching services will be blocked from registration to it's index |
| <code>emir.record.blockList</code> | filesystem path | <code>CONF/outputfilter</code> | The file containing list of SER IDs, matching services will be blocked from propagation to it's parent DSR |

4.9 Logging Configuration

The EMIR server uses [log4j](#) to provide log facilities to record all but some of the server activities. In order to change the logging configuration, `CONF/log4j.properties` should be reviewed by the administrator.

| Property name | Type | Default value | Description |
|----------------------------------|-----------------|-----------------------------|-------------------------|
| <code>log4j.configuration</code> | filesystem path | <code>STARTUP_SCRIPT</code> | The log4j configuration |

4.10 Advanced HTTP Server Settings

EMIR uses Eclipse's Jetty server to host REST Web services. Following table lists the important properties.

**Important**

Do not set **emir.jetty.requireClientAuthn** and **emir.jetty.wantClientAuthn** in CONF/emir.config file, as they are automatically set by the EMIR server on start-up.

| Property name | Type | Default value / mandatory | Description |
|-----------------------------------|----------------|---------------------------|---|
| emir.jetty.disableCipherSuites | string | empty string | Space separated list of SSL cipher suites to be disabled. |
| emir.jetty.fastRandom | [true, false] | false | Use insecure, but fast pseudo random generator to generate session ids instead of slow and secure generator for SSL sockets. Useful for testing. |
| emir.jetty.gzip.enabled | [true, false] | false | Controls whether to enable compression of HTTP responses. |
| emir.jetty.gzip.minGzipSize | integer number | 100000 | Specifies the minimal size of message that should be compressed. |
| emir.jetty.highLoadConnections | integer > 0 | 200 | If the number of connections exceeds this amount, then connector is put into a special <i>low on resources</i> state. Existing connections will be closed faster. Note that this value is honored only for NIO connectors. Legacy connectors go into low resources mode when no more threads are available. |
| emir.jetty.lowResourceMaxIdleTime | integer > 0 | 1000 | In low resource conditions, time (in ms.) before an idle connection will time out. |
| emir.jetty.maxIdleTime | integer > 1 | 200000 | Time (in ms.) before an idle connection will time out. It should be large enough not to expire connections with slow clients, values below 30s are getting quite risky. |

| Property name | Type | Default value / mandatory | Description |
|------------------------------|----------------|---------------------------|--|
| emir.jetty.maxThreads | integer > 1 | 255 | Maximum number of threads to have in the Jetty thread pool for connections serving. |
| emir.jetty.minThreads | integer > 1 | 1 | Minimum number of threads to have in the Jetty thread pool for connections serving. |
| emir.jetty.requireClientAuth | [true, false] | true | Controls whether the SSL socket requires client-side authentication. |
| emir.jetty.soLinger | integer number | -1 | Socket linger time. |
| emir.jetty.useNIO | [true, false] | false | Controls whether the NIO connector be used. NIO is best suited under high-load, when lots of connections exist that are idle for long periods. |
| emir.jetty.wantClientAuth | [true, false] | true | Controls whether the SSL socket accepts client-side authentication. |

5 EMIR Service Endpoint Record Publisher (EMIR-SERP) Client

5.1 About the EMIRD

The UMD services need to be registered into the EMI Registry service infrastructure to be discoverable for the clients. Most of the services or even the containers executing them provide a way to do this but not all of them. For those that are unable to register themselves automatically and periodically the EMIRD is available.

The EMIRD is a daemon like (background) service that can be executed next to these services (preferably on the same machine) and able to perform the automatic and periodical registration and update against the configured EMI Registry service on behalf of the service itself. This client uses exactly the same, standard RESTful API as the other clients do.

Most of the parameters of these registrations and updates can be configured. For the details see the [Configuration section](#)!

After the successful registration until the termination of the daemon, the EMIRD client do the periodical updates then finally, when the execution of the daemon is over, it attempts to delete the service entries from the remote database.

The service entries can be simple or advanced ones.

The simple service entries contain only the mandatory and easily configurable attributes that are the following: `Service_Name`, `Service_Type`, `Service_Endpoint_URL`, `Service_Endpoint_InterfaceName`. Here, the single mandatory element is the `Service_Endpoint_URL`.

The advanced entries can contains any kind of key value pairs that are accepted by the EMI Registry services and can be configured in the form of whole, formatted **json** documents.

5.2 Installation

The installation of the EMIRD client is trivial. The only thing to do is to install the `emir-daemon` package from the EMI repository by executing:

```
yum instal emir-daemon
```

5.3 Configuration

The configuration of EMIRD can be performed by editing its configuration file or files. The configuration can be found basically in one file that default location is `/etc/emi/emird/emird.ini`.

This file contains every configuration options that can be the EMIRD daemon control by, like *service url*, *logging verbosity*, *credential location*, etc.

The advanced service entries to be propagated can be described in separated configuration files preferably also under this directory and use to have `.json` extension.

The main configuration file has INI format. The `emir` section contains the daemon scoped options while the others are to describe the different service entries to be registered. In these cases the exact name is indifferent, they just have to differ from eachother and must avoid the `emir` name as well.

5.3.1 Configuration options

Note: The option names are case-insensitives.

url

Location: `emir` section

Default value: *No default value*

Mandatory: Yes

Description:

URL of the EMIR service to connect in a `protocol://domain:port` format.

The protocol part is not mandatory if `https` (default) The port part is not mandatory if `54321` (default) The domain part is mandatory

Examples: `url = emiregistry2.grid.niif.hu` `url = https://emiregistry2.grid.niif.hu` `url = https://emiregistry2.grid.niif.hu:54321`

period

Location: `emir section`

Default value: *No default value*

Mandatory: Yes

Description:

The period of the registration/update messages. Its value is given in minutes.

validity

Location: `emir section`

Default value: *No default value*

Mandatory: Yes

Description:

The validity of the registration entries. Its value is given in minutes.

cert

Location: `emir section`

Default value: `/etc/grid-security/hostcert.pem`

Mandatory: No

Description:

User certificate file location in PEM format. Only used and checked if the protocol in the url option is *https*.

key

Location: `emir section`

Default value: `/etc/grid-security/hostkey.pem`

Mandatory: No

Description:

User key file location in PEM format. Only used and checked if the protocol in the url option is *https*.

cadir

Location: emir section

Default value: */etc/grid-security/certificates*

Mandatory: No

Description:

A path pointing to the store where the PEM certificate of the trusted Certificate Authorities can be found. Only used and checked if the protocol in the url option is *https*.

verbosity

Location: emir section

Default value: *error*

Mandatory: No

Description:

Logging verbosity. The parameter is optional. If missing or an invalid value is given, the default value will be used. The logs are written into the log file that can be found in the */var/log/emi/emird* directory by default.

Service_Endpoint_URL

Location: simple service entry section

Default value: *No default value*

Mandatory: Yes

Description:

The Service Endpoint URL to be propagated. If this option is missing an error message will be raised.

Service_Name

Location: simple service entry section

Default value: *No default value*

Mandatory: No

Description:

The Service Name to be propagated. If this option is missing then the service entry will contains no such component.

Service_Type

Location: simple service entry section

Default value: *No default value*

Mandatory: No

Description:

The Service Type to be propagated. If this option is missing then the service entry will contains no such component.

Service_Endpoint_InterfaceName

Location: simple service entry section

Default value: *No default value*

Mandatory: No

Description:

The Service Endpoint Interface Name to be propagated. If this option is missing then the service entry will contains no such component.

json_file_location

Location: advanced service entry section

Default value: *No default value*

Mandatory: Yes

Description:

The service entry can be also defined in a single external json formatted file per service. Any allowed json attributes are allowed in this way. The location of this file must be defined in this ini variable. The recommended place for these files is under the `/etc/emi/emird/` directory and naming them after the name of the given service with `.json` extension.

6 REST API

The EMI Registry allows Services to register/publish their capabilities while the Service Consumers are able to find the deployed services.

This section contains the description of the REST-ful interface, that allows the management of the service information (or entries) by exposing the individual URIs. The normative description of the API cab also be defined as Web Application Description Language (WADL) document [WADL Section 8](#).

6.1 Register new Services

HTTP Method: POST

URI: /serviceadmin

Content Type: application/json

Security Implications: Requires authenticated "and" authorized user access to perform this operation

6.1.1 Request

The message body contain a JSON Array containing the JSON objects (see below), each of which would be a service entry in the EMI registry.

Service description is defined as a [Section 7](#) document.



Important

The only mandatory attribute is **Service_Endpoint_URL**, which should be unique

6.1.2 Response

The response contains similar array of JSON Objects as it was in sent request, confirming the successful update.

Status Code: OK / 200

6.2 Updating the Service information

HTTP Method: PUT

URI: /serviceadmin

Content Type: application/json

Security Implications: Requires an authenticated "and" authorized user access to perform this operation

6.2.1 Request

The request body contain a similar JSON array object as defined POST method that contains the description of the Services to be updated. The Service Entries identified by the *Service_Endpoint_URL* key in the individual JSON objects will be updated respectively.

6.2.2 Response

The response contains similar array of JSON Objects as it was in sent request, confirming the successful update.

Status Code: OK / 200

6.3 Delete existing Services

HTTP Method: DELETE

URI: /serviceadmin

Security Implications: Requires an authenticated "and" authorized user access to perform this operation

6.3.1 Request

The Service Entry matching the Endpoint URL will be deleted from the database only if the client executing the action has authorized access and the method is allowed by the security plugins.

Query Parameters: Service_Endpoint_URL= <service unique URL>

Example: /serviceadmin?Service_Endpoint_URL=http://1

6.3.2 Response

Status Code: OK / 200

6.4 Querying the EMIR

HTTP Method: GET

URI: /services

Content Type: application/json

6.4.1 Request

The request contains the key-value pairs separated by ampersand &

Query Parameters: AttributeName=<Attribute_Value>&AttributeName=<Attribute_Value>&...

Example : /services?Service_Type=eu.emi.es&Service_Endpoint_HealthState=ok

The additional parameters can also be added to restrict and/or paginate the result

Additional Query Parameters :

skip=Integer value

skip returns the result skipping the given number of entries

limit=Integer value

limit defines the maximum number of result containing the service entries

Response+Additional Query Parameters+ :

skip=Integer value

skip returns the result skipping the given number of entries

limit=Integer value

limit defines the maximum number of result containing the service entries

The response contains an array of service entries packed in a JSON array object

Status Code : OK / 200

6.5 Rich Querying in EMIR

HTTP Method : GET

URI : /services

Content Type : application/json

6.5.1 Request

The request contains the JSON document including with support for defining advanced clauses, the <http://www.mongodb.org/display/DOCS/Advanced+Queries>, MongoDB Advanced Queries[MongoDB JSON Query Language] describes the various types of queries

Additional keys (skip, limit) can also be added to paginate the returning results.

6.5.2 Response

The response contains the array of service entries packed in a JSON array object

Status Code : OK / 200

6.6 Querying the EMIR for GLUE 2.0 XML Documents

HTTP Method: GET

URI: /services

Content Type: application/xml

6.6.1 Request

The request contains the key-value pairs separated by ampersand &

Query Parameters: AttributeName=<Attribute_Value>&AttributeName=<Attribute_Value>&...

Example : /services?Service_Type=eu.emi.es&Service_Endpoint_HealthState=ok

The additional parameters can also be added to restrict and/or paginate the result

Additional Query Parameters:

skip=Integer value

skip returns the result skipping the given number of entries

limit=Integer value

limit defines the maximum number of result containing the service entries

6.6.2 Response

The response contains an XML document containing service entries in GLUE 2.0 format

Status Code: OK / 200

6.7 Rich Querying the EMIR for GLUE 2.0 XML Documents

The request and response interface is same as defined above, however the content type must be defined as **application/xml** instead.

6.8 Viewing the Service information template

This To view the GLUE 2.0's JSON flavored service model.

HTTP Method: GET

URI: /model

Content Type: application/json

6.8.1 Request

N/A

6.8.2 Response

JSON document, as described in the /serviceadmin POST method

Status Code: OK / 200

6.9 Monitoring the Registry

Allows registry users to view the registry status

HTTP Method: GET

URI: /ping

6.9.1 Request

N/A

6.9.2 Response

Status Code: OK / 200

7 Appendix I

The service record JSON template of EMIR interface.

```
[
    //Example Service Endpoints Records (belonging to the same
    service)
    {
        "Service_ID":"s1",
        "Service_Name":"ComputingService",
        "Service_CreationTime":{"$date":"2011-07-21T11
        :47:24Z"},
        "Service_Type":"job-management",
        "Service_Contact": [{"ContactType":"sysadmin", "
        Detail":"http://contactlink"}, {"ContactType":"
        developer", "Detail":"http://contactlink"}],
        "Service_Endpoint_ID":"se1", //this should be
        unique
        "Service_Endpoint_URL":"http://1",
```

```

        "Service_Endpoint_Capability":["capability1","↵
        capability2"],
        "Service_Endpoint_Technology":"technology",
        "Service_Endpoint_InterfaceName":"interface",
        "Service_Endpoint_InterfaceVersion":["version1","↵
        version2"],
        "Service_Endpoint_InterfaceExtension":["extension1↵
        ","extension2"],
        "Service_Endpoint_WSDL":"http://1.wsdl",
        "Service_Endpoint_SupportedProfile":["profile1","↵
        profile2"],
        "Service_Endpoint_Semantics":["semantic1","↵
        semantic2"],
        "Service_Endpoint_HealthState":"ok",
        "Service_Endpoint_HealthStateInfo":"state info",
        "Service_Endpoint_ServingState":"production",
        "Service_Endpoint_StartTime":{"$date":"2011-07-21↵
        T11:47:24Z"},
        "Service_Endpoint_DowntimeAnnounce":{"$date↵
        ":"2011-07-21T11:47:24Z"},
        "Service_Endpoint_DowntimeStart":{"$date↵
        ":"2011-07-21T11:47:24Z"},
        "Service_Endpoint_DowntimeEnd":{"$date":"2011-07-21↵
        T11:47:24Z"},
        "Service_Endpoint_QualityLevel":"production",
        "Service_Location_Address":"A Street 1",
        "Service_Location_Place":"Bonn",
        "Service_Location_Country":"Germany",
        "Service_Location_PostCode":"53119",
        "Service_Location_Latitude":53.3,
        "Service_Location_Longitude":4,
        "Service_ExpireOn":{"$date":"2020-07-21T11:47:24Z"}
    },
    {
        "Service_ID":"s1",
        "Service_Name":"ComputingService",
        "Service_CreationTime":{"$date":"2011-07-21T11↵
        :47:24Z"},
        "Service_Type":"job-management",
        "Service_Contact": [{"ContactType":"sysadmin", "↵
        Detail":"http://contactlink"}, {"ContactType":"↵
        developer", "Detail":"http://contactlink"}],
        "Service_Endpoint_ID":"se2", //this should be↵
        unique
        "Service_Endpoint_URL":"http://1",
        "Service_Endpoint_Capability":["capability1","↵
        capability2"],
        "Service_Endpoint_Technology":"technology",
        "Service_Endpoint_InterfaceName":"interface",

```

```

        "Service_Endpoint_InterfaceVersion":["version1","↵
        version2"],
        "Service_Endpoint_InterfaceExtension":["extension1 ↵
        ","extension2"],
        "Service_Endpoint_WSDL":"http://1.wsdl",
        "Service_Endpoint_SupportedProfile":["profile1","↵
        profile2"],
        "Service_Endpoint_Semantics":["semantic1","↵
        semantic2"],
        "Service_Endpoint_HealthState":"ok",
        "Service_Endpoint_HealthStateInfo":"state info",
        "Service_Endpoint_ServingState":"production",
        "Service_Endpoint_StartTime":{"$date":"2011-07-21 ↵
        T11:47:24Z"},
        "Service_Endpoint_DowntimeAnnounce":{"$date ↵
        ":"2011-07-21T11:47:24Z"},
        "Service_Endpoint_DowntimeStart":{"$date ↵
        ":"2011-07-21T11:47:24Z"},
        "Service_Endpoint_DowntimeEnd":{"$date":"2011-07-21 ↵
        T11:47:24Z"},
        "Service_Endpoint_QualityLevel":"production",
        "Service_Location_Address":"A Street 1",
        "Service_Location_Place":"Berlin",
        "Service_Location_Country":"Germany",
        "Service_Location_PostCode":"53011",
        "Service_Location_Latitude":53.5,
        "Service_Location_Longitude":4,
        "Service_ExpireOn":{"$date":"2020-07-21T11:47:24Z"}
    }
}
]

```

8 Appendix II

The EMIR WADL document to define the REST-ful API

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<application xmlns="http://wadl.dev.java.net/2009/02">
  <doc xmlns:jersey="http://jersey.java.net/" jersey:generatedBy ↵
  ="Jersey: 1.9.1 09/14/2011 02:05 PM"/>
  <grammars/>
  <resources base="https://localhost:54321/">
    <resource path="/children">
      <method id="childDSRs" name="GET">
        <response>
          <representation mediaType="*/*/>
        </response>
      </method>
    </resource>
  </resources>
</application>

```



```
</method>
<method id="checkin" name="POST">
  <response>
    <representation mediaType="*/*/>
  </response>
</method>
</resource>
<resource path="/neighbors">
  <method id="childDSRs" name="GET">
    <response>
      <representation mediaType="*/*/>
    </response>
  </method>
</resource>
<resource path="/parent">
  <method id="childDSRs" name="GET">
    <response>
      <representation mediaType="*/*/>
    </response>
  </method>
</resource>
<resource path="/serviceadmin">
  <method id="getServicebyUrl" name="GET">
    <response>
      <representation mediaType="application/json"/>
    </response>
  </method>
  <method id="registerServices" name="POST">
    <request>
      <representation mediaType="application/json"/>
    </request>
    <response>
      <representation mediaType="application/json"/>
    </response>
  </method>
  <method id="updateServices" name="PUT">
    <request>
      <representation mediaType="application/json"/>
    </request>
    <response>
      <representation mediaType="application/json"/>
    </response>
  </method>
  <method id="deleteService" name="DELETE">
    <response>
      <representation mediaType="*/*/>
    </response>
  </method>
</resource>
<resource path="/services">
```

```
<method id="queryWithParams" name="GET">
  <response>
    <representation mediaType="application/json"/>
  </response>
</method>
<method id="queryWithJSON" name="POST">
  <request>
    <representation mediaType="application/json"/>
  </request>
  <response>
    <representation mediaType="application/json"/>
  </response>
</method>
<method id="queryXMLWithJSON" name="POST">
  <request>
    <representation mediaType="application/json"/>
  </request>
  <response>
    <representation mediaType="application/xml"/>
  </response>
</method>
<method id="queryXMLWithParams" name="GET">
  <response>
    <representation mediaType="application/xml"/>
    <representation mediaType="text/xml"/>
  </response>
</method>
<resource path="/urls">
  <method id="getServiceEndpoints" name="GET">
    <response>
      <representation mediaType="application/json" ↵
        "/>
    </response>
  </method>
</resource>
<resource path="/types">
  <method id="getServiceTypes" name="GET">
    <response>
      <representation mediaType="application/json" ↵
        "/>
    </response>
  </method>
</resource>
<resource path="/query.xml">
  <method id="queryXml" name="GET">
    <response>
      <representation mediaType="application/xml" ↵
        "/>
      <representation mediaType="text/xml"/>
    </response>
  </method>
</resource>
```

```
        </method>
      </resource>
      <resource path="/pagedquery">
        <method id="pagedQuery" name="GET">
          <response>
            <representation mediaType="*/*/">
            </representation>
          </response>
        </method>
      </resource>
    </resource>
    <resource path="/model">
      <method id="getModel" name="GET">
        <response>
          <representation mediaType="text/html"/>
          <representation mediaType="application/json"/>
        </response>
      </method>
    </resource>
    <resource path="/ping">
      <method id="ping" name="GET">
        <response>
          <representation mediaType="application/json"/>
          <representation mediaType="text/plain"/>
        </response>
      </method>
    </resource>
  </resources>
</application>
```